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ABSTRACT

This study focused on two questions concerning children's attention to verbal stimulus: How do children of different reading ability attend to repeatedly presented words? Are there differences in children's patterns of attention to words as compared to less meaningful materials? Toward the end of an academic year, 40 first-graders and 40 fifth-graders were divided into two groups; a word group and a color group. In the word group, 20 children from each grade level, observed 30 3-second slide presentations of one of several common four-letter words (all words were in the vocabularies of the first graders). In the color group, the remaining 20 children from each level, observed 30 3-second slide presentations of one of two colors, either red or blue. Following this familiarization, children from both groups participated in a 40-trial choice reaction-time task. For the word group, the familiarized word was one target and a novel word was the second target. For the color group, the familiarized color was one target and a novel color was the second. The major result of the study was an interaction of grade, group, and stimulus type. Fifth-graders responded slower to the familiarized stimulus when responding to colors, but faster to the familiarized stimulus when responding to words. In contrast, first-graders responded slower to the familiarized stimulus regardless of whether they were responding to colors or words. The findings suggest that the process by which words are encoded by beginning readers may be very different from the process used by more mature readers. (MP)

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Familiarization and the Development of Attention: Verbal vs. Non-Verbal Materials

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We thank Allen Tyndall, Jim Wheeler, Sam Robinson and the teachers and students of the Giles County Virginia school system for their cooperation.

For a few years we have been investigating the effects of a repeatedly presented stimulus on attention. The findings I will present today represent an attempt to extend that investigation in order to answer some questions about children's attention to verbal materials: How do children of different reading abilities attend to repeatedly presented words? Are there differences in children's patterns of attention to words as compared to less meaningful materials?

Our thoughts on stimulus repetition and attention stem mainly from a number of experiments in which a similar two-part method has been used: First, a subject sits before a rear projection screen and is shown 30 or so brief (2-3 sec) presentations of a single stimulus (slide 1, a blue circle). The subject does nothing but look at the stimulus slide each time it is presented. Second, following this familiarization, the subject responds to 40-50 two-choice reaction time trials. This repeatedly presented color is the target for half the trials; a novel color (e.g., red) is the target for the remaining trials.

What has been found in more than a dozen studies of this type, many fo them conducted by Gordon Cantor and his colleagues, is that subjects, both children and adults, respond slower to the familiarized color than to the novel color. A typical finding is shown here (slide 2).

We reasoned that this finding might result from the effects of stimulus repetition on two components of attention identified in the work of Posner and Boies. One component, alertness, refers to processes responsible for developing a general response readiness to any event. The second component, encoding, refers to processes that select specific information from an event.

Our theory is that stimulus repetition affects these two components of attention, alertness and encoding, in opposite ways. The alerting properties of a familiarized stimulus are decreased, but the encoding of a familiarized stimulus is facilitated. Alertness decrement contributes to slow responding to a familiarized stimulus, but encoding facilitation contributes to fast responding to a familiarized stimulus. In several experiments we have provided evidence for these opposite effects. When responses are slower to a familiarized stimulus than to a novel, as shown in this slide, it follows that alertness decrement outweighs encoding facilitation. However, this result might be reversed if we could change the weighted position of alertness to encoding.

A number of variations in the familiarization procedure have resulted in just such a reversal. For example, the alertness decrement accounting for slow responses seems to decay with time. If there is a 15 or 30 min interval between familiarization and test, subjects respond faster to a familiarized stimulus than to a novel (slide 3).

Procedural changes, then, affect the balance between alertness decrement and encoding facilitation. This study examines developmentally the effects of stimulus variables on that same balance. Stimuli in familiarization experiments have been simple colors. What would occur if more complex or meaningful stimuli, such as verbal materials, were used.

One possibility is that more meaningful stimulus would affect encoding facilitation more than alertness decrement. As stated earlier, encoding is that component of attention concerned with selecting specific information.

If little information is available, as might occur when colors are presented, encoding should not play much of a role in attention. However, it seems, at least intuitively, that words provide substantially more information than colors. The role encoding plays in identifying a word may be increased over its role in identifying a color. Although a familiarized color is normally responded to more slowly than a novel color, indicating alertness decrement outweighs encoding facilitation, a familiarized word might be responded to faster than a novel word, indicating that encoding facilitation outweighs alertness decrement.

There is at least one catch to this prediction. In order for a word to materially affect encoding, a subject must be sensitive to the word as representing substantial information. The subject must perceive the meaningful stimulus. This might occur when older children are presented with words, but what about beginning readers? Do they attend to words as meaningful units or on the same level as they attend to simpler stimuli?

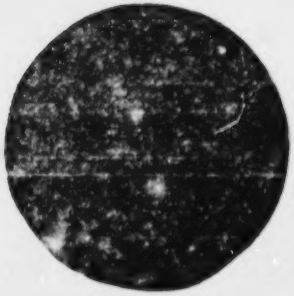
To determine whether words and colors elicit different patterns of attention and to see whether these patterns are related to reading ability, the following experiment was conducted.

Forty first-graders and 40 fifth graders were tested toward the end of an academic year. First-graders had just under one year of formal reading instruction. All children were seen individually. As in previous studies the procedure consisted of two parts. Twenty children at each grade level observed 30 3-sec slide presentations of one of several common four-letter words. All words were in the reading vocabularies of the first-graders. The remaining 20 children at each grade level observed 30 3 sec slide presentations of one of two colors, either red or blue. So, subjects were divided into a word group and a color group.

Immediately following familiarization all children participated in a 40 trial choice reaction-time task. For the word group, the familiarized word was one target; A novel word was the second target. For the color group, the familiarized color was one target; The novel color was the second.

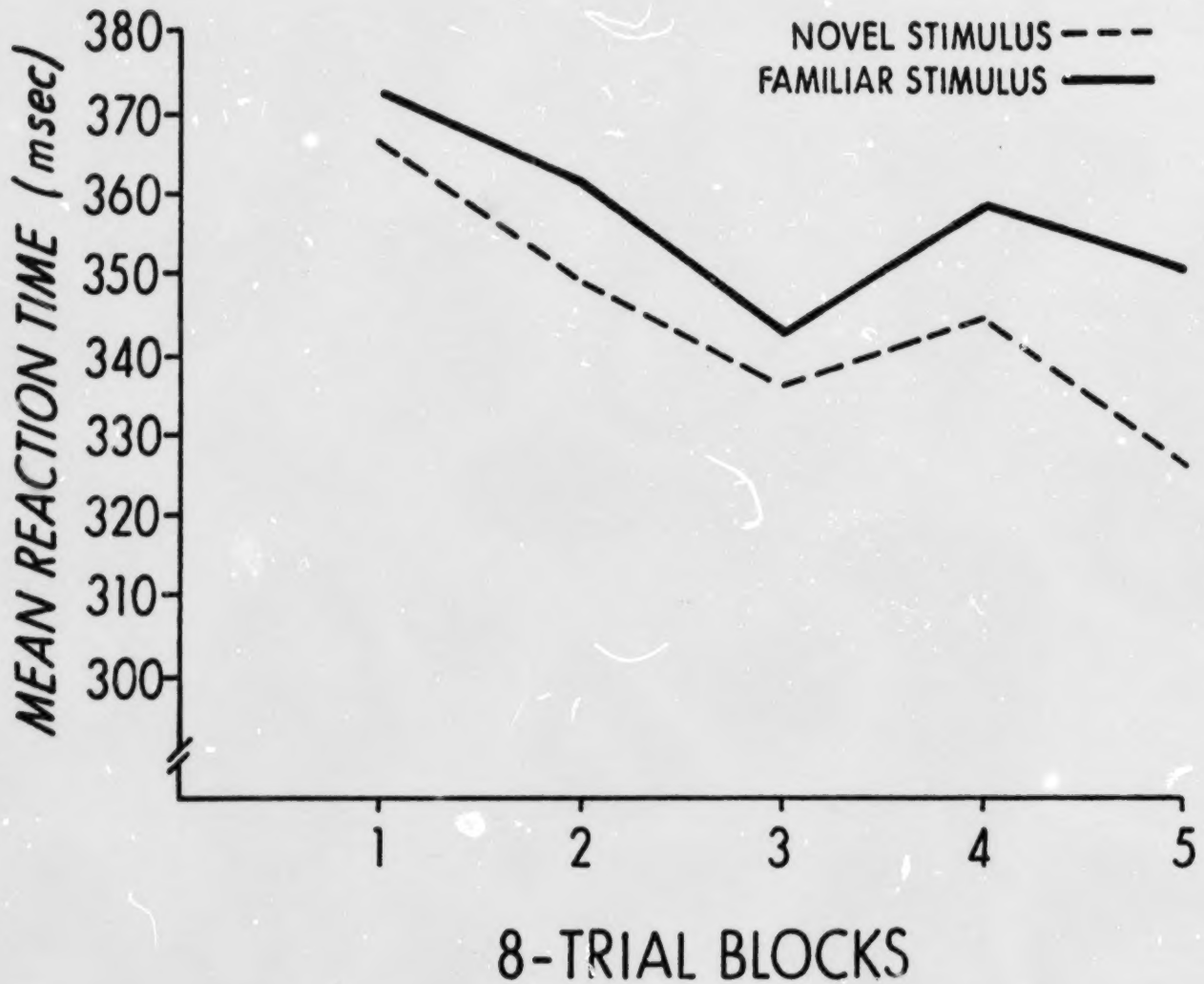
The major result of the study was an interaction of Grade, Group and Stimulus Type (slide 4). Fifth-graders responded slower to the familiarized stimulus when responding to colors, but faster to the familiarized stimulus when responding to words. In contrast, first-graders responded slower to the familiarized stimulus regardless of whether they were responding to colors or words.

The results from fifth-graders are consistent with our prediction of how stimulus variables affect attention. As stimulus materials become more complex encoding becomes more apparent than alertness. However, the results from first-graders suggest something different. Interpreted within the two-factor theory it appears that first-graders did not fully encode the words they read, at least to the same extent more mature readers did. This is curious, though, because the first-graders in this study were perfectly able to read and understand all the words we presented. So exactly how their encoding of words differed from more mature encoding is unclear. Perhaps the type of encoding assessed in this procedure is what might be termed automatic encoding and it may be that first-graders encoding of words required some kind of deliberate word-to-meaning translation. This process prevented words from being encoded as automatically as they were for older children. The findings suggest that the process by which words are encoded by beginning readers may be very different from the process used by more mature readers.

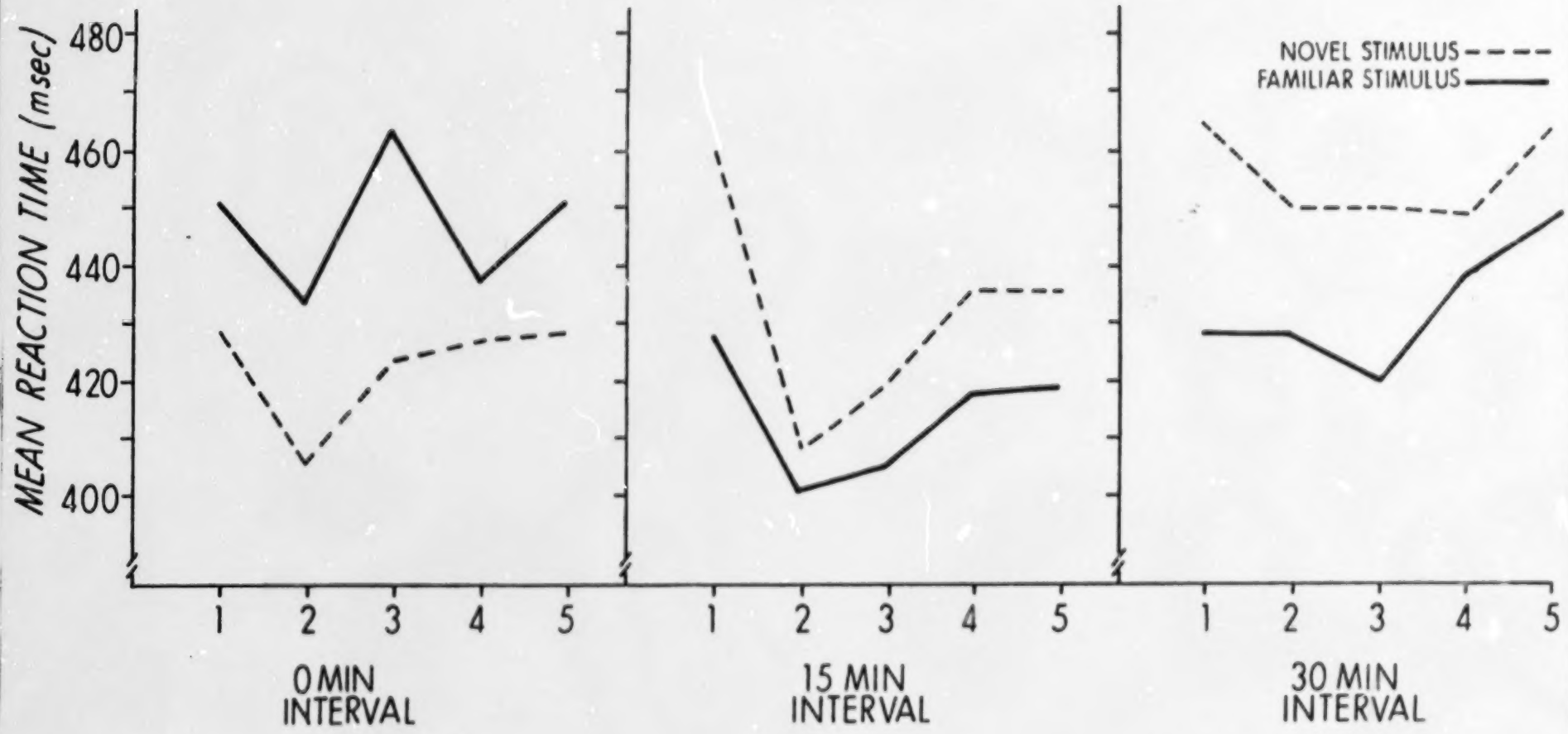


Blue

FAMILIARIZED STIMULUS
Presented for 30 2- to 3- sec exposures



Response speed to familiar and novel stimuli under replication conditions



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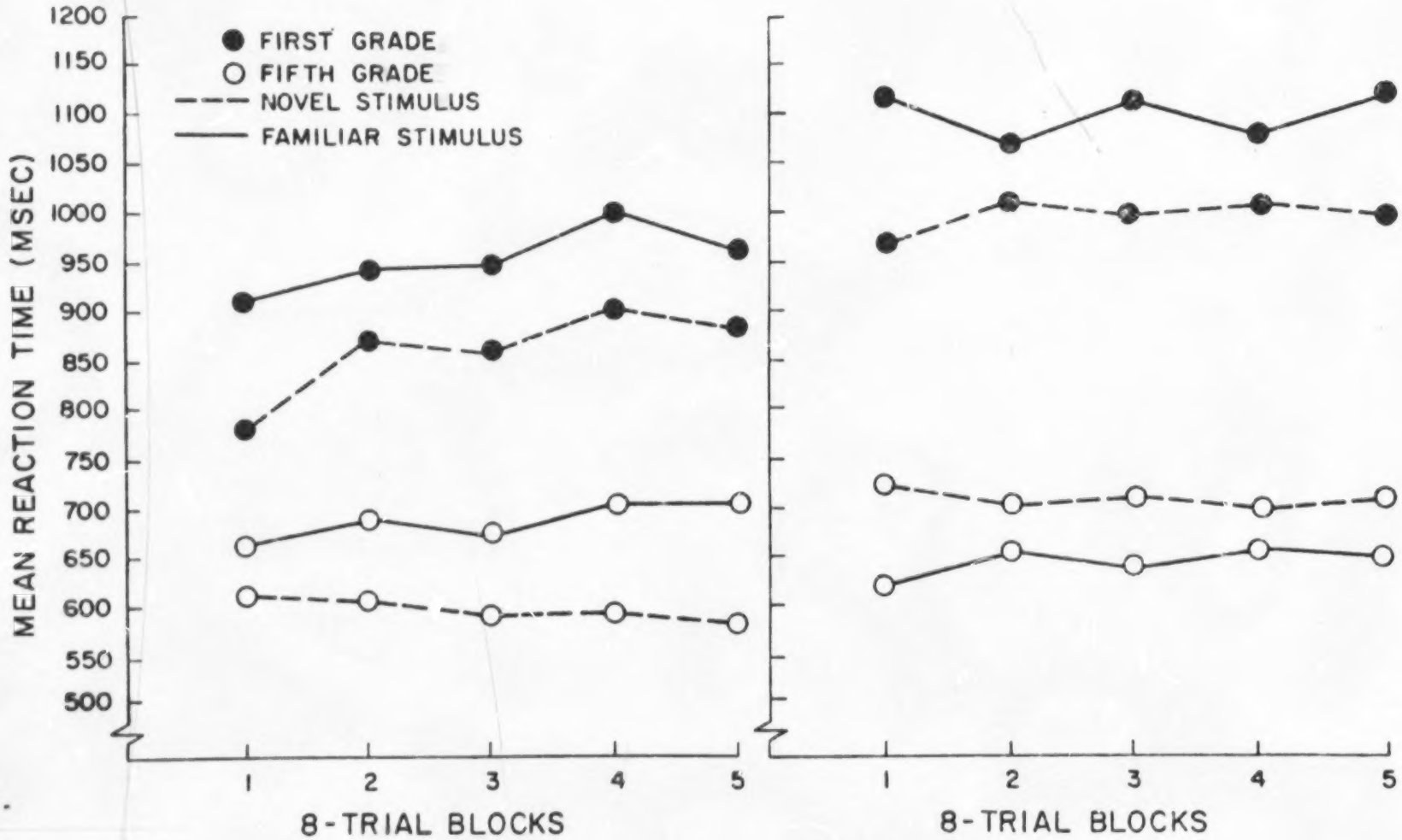
REACTION TIME TO NOVEL AND FAMILIAR STIMULI AT A FUNCTION OF FAMILIARIZATION-TEST INTERVAL



FIRST AND FIFTH GRADERS' REACTION TIME TO FAMILIARIZED AND NOVEL COLORS

FIRST AND FIFTH GRADERS' REACTION TIME TO FAMILIARIZED AND NOVEL WORDS